



Spectral Gamma-Ray Borehole Log Data Report

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Borehole

21-10-01

Log Event A

Borehole Information

Farm : <u>BX</u>	Tank : <u>BX-110</u>	Site Number : <u>299-E33-167</u>
N-Coord : <u>45,432</u>	W-Coord : <u>53,519</u>	TOC Elevation : <u>656.12</u>
Water Level, ft :	Date Drilled : <u>9/30/1971</u>	

Casing Record

Type : <u>Steel-welded</u>	Thickness : <u>0.280</u>	ID, in. : <u>6</u>
Top Depth, ft. : <u>0</u>	Bottom Depth, ft. : <u>100</u>	

Borehole Notes:

Borehole 21-10-01 was drilled in September 1971. The borehole was completed with 6-in. casing at a depth of 100 ft. The casing thickness is presumed to be 0.280 in., on the basis of the published thickness for schedule-40, 6-in. steel pipe, which was typically used as casing during the early 1970s drilling campaign. Although no information concerning grouting or perforations is provided, it is assumed that the borehole was not grouted or perforated since this was not a routine practice during the 1970s drilling campaign. The top of the casing, which is the zero reference for the SGLS, is approximately 0.5 ft below the ground surface. The present depth of the borehole was measured at 99.4 ft.

Equipment Information

Logging System : <u>2</u>	Detector Type : <u>HPGe</u>	Detector Efficiency: <u>35.0 %</u>
Calibration Date : <u>04/1997</u>	Calibration Reference : <u>GJO-HAN-14</u>	Logging Procedure : <u>P-GJPO-1783</u>

Log Run Information

Log Run Number : <u>1</u>	Log Run Date : <u>08/07/1997</u>	Logging Engineer: <u>Bob Spatz</u>
Start Depth, ft.: <u>98.5</u>	Counting Time, sec.: <u>100</u>	L/R : <u>L</u> Shield : <u>N</u>
Finish Depth, ft. : <u>28.5</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>
Log Run Number : <u>2</u>	Log Run Date : <u>08/08/1997</u>	Logging Engineer: <u>Bob Spatz</u>
Start Depth, ft.: <u>29.5</u>	Counting Time, sec.: <u>100</u>	L/R : <u>L</u> Shield : <u>N</u>
Finish Depth, ft. : <u>0.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>
Log Run Number : <u>3</u>	Log Run Date : <u>08/08/1997</u>	Logging Engineer: <u>Bob Spatz</u>
Start Depth, ft.: <u>55.0</u>	Counting Time, sec.: <u>100</u>	L/R : <u>L</u> Shield : <u>N</u>
Finish Depth, ft. : <u>35.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>



Borehole

21-10-01

Log Event A

Analysis Information

Analyst : H.D. Mac Lean

Data Processing Reference : MAC-VZCP 1.7.9

Analysis Date : 01/12/1998

Analysis Notes :

This borehole was logged by the SGLS in three log runs. A centralizer was used during all logging runs. Two logging runs were required to complete the log of the borehole. A third logging run repeated a segment of the initial borehole log as an additional quality assurance measure. The pre- and post-survey field verification spectra met the acceptance criteria established for the peak shape and detector efficiency, confirming that the SGLS was operating within specifications. The energy calibration and peak-shape calibration from the pre- or post-survey field verification spectrum that most closely matched the logging run data were used to establish the peak resolution and channel-to-energy parameters used in processing the spectra acquired during a particular logging run. There was negligible gain drift during the logging runs; it was not necessary to adjust the established channel-to-energy parameters to maintain proper peak identification.

Casing correction factors for a 0.280-in.-thick steel casing were applied during analysis.

The man-made radionuclides Cs-137 and Co-60 were detected in this borehole log. Cs-137 contamination was detected in three distinct zones. The upper zone of Cs-137 contamination is continuous from the ground surface to a depth of 29 ft. Measured concentrations vary from about 15 to 0.5 pCi/g, with peaks in the concentrations at 1 and 5 ft. The intermediate zone of Cs-137 contamination extends from 38 to 56 ft. Measured concentrations vary from 0.5 to about 60 pCi/g; peaks in the measured concentrations within this zone occur at depths of about 40 ft (60 pCi/g) and 47 ft (5 pCi/g). A third zone of Cs-137 contamination occurs between 68 and 75 ft. The maximum measured concentration in this interval was about 1 pCi/g. Cs-137 contamination was also detected intermittently from 80 to 91 ft at concentrations just above the MDL (about 0.2 pCi/g).

Co-60 contamination was detected in the same interval as the intermediate depth Cs-137 contamination and intermittently from 41.5 to 62 ft. Measured concentrations range from 0.1 to 0.5 pCi/g.

The logs of the naturally occurring radionuclides show that the K-40 concentrations increase at 42 ft from a background of about 8 pCi/g above this depth to a background of about 15 pCi/g below this depth. The U-238 concentrations are anomalously high in the interval from 30 to 50 ft.

An analysis of the shape factors associated with the logging spectra was performed. The shape factors describe the continua from various radionuclides. They also provide insights into the distribution of man-made radionuclide contamination and into the nature of zones of elevated total count gamma-ray activity not attributable to gamma-emitting radionuclides.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Reports for tanks BX-107 and BX-110.

Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations. Uncertainty bars on the plots show the statistical uncertainties for the



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measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

A plot of the spectrum shape factors is included. The plot is used as an interpretive tool to help determine the radial distribution of man-made contaminants around the borehole.

A separate plot of the repeated segment of the log is included. The plot shows the concentrations of the Cs-137 and the naturally occurring radionuclides measured by the original and repeated logging runs. The uncertainty of each measurement (two sigma or 95-percent confidence level) is indicated on the plot. The concentrations measured by the original and repeated logging runs are generally within the indicated uncertainty of the measurements.

A set of historical plots from 1975 to 1989 is also included.